Crystal Growth of Ternary Compound Semiconductors (GTS)

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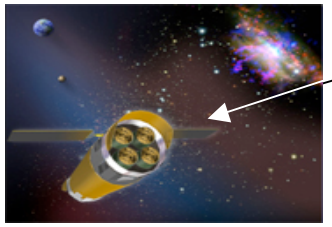
Objective:

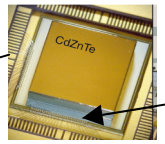
- In crystal growth there is a need to understand the relation between processes in the fluid phase, both liquid and vapor, such as buoyancy driven convection, the incorporation of impurities, and defects in the resulting crystal.
- Relation between fluid phase processes and the generation of defects in a grown crystal is an outstanding problem in materials growth.
- Studies in microgravity will be compared with modeling and will be used to optimize ground-based experiments.

Relevance/Impact:

- Crystal quality greatly influences important electronic properties in materials.
- Ternary compound semiconductors are of vital national interest as sensors in x-ray telescopes and for homeland security, and as substrate materials for infrared sensors.



Constellation-X
X-Ray Telescope

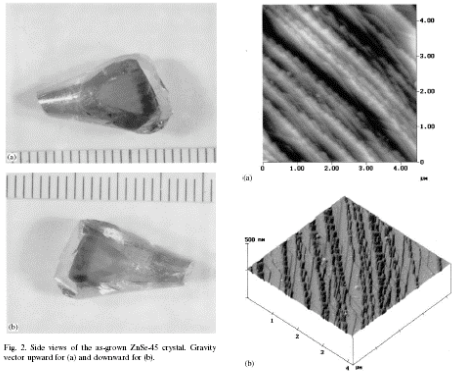


CdZnTe FPA for X-Ray Telescope

As-grown CdZnTe Boule

Development Approach:

- Vapor transport and directional solidification will be investigated in compounds including alloyed ZnSe, and CdZnTe. Phase equilibria and other thermodynamic properties are being studied on the ground.
- The high vapor pressures are ideal for enabling vapor transport, but can deleteriously affect stoichiometry, which results in precipitates.



Crystal terraces on this (110) facet are separated by ~0.5 mm on the freshly grown surface and were measured between 20 and 60 nm height. Facet tends to align parallel to gravity vector.

ISS Resource Requirements

SCR 10/1998. Flight samples will be processed in the Low Gradient Furnace (LGF), an ESA module which will reside in the ESA Materials Science Laboratory (MSL) within NASA's Materials Science Research Rack (MSRR-1). Launch on UF-2, early 2009.